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ABSTRACT

A theoretical model of publication productivity was studied to see if it was applicable to professors in various types of institutions. The impact of several correlates of publications within doctoral universities and comprehensive colleges and universities were evaluated, thus addressing several questions about the extent to which organizational factors and individual differences in preparation, prior activities, and perceptions influence faculty publication. Data for the study were drawn from "Faculty at Work," a national survey conducted by the National Center for Research to Improve Postsecondary Teaching and Learning in 1987 and 1988. In addition to standard socio-demographic and career indicators, the survey instrument measured faculty perceptions of their colleges and universities as well as their own competence and efficacy, values and beliefs, and psychological dispositions. Measures of career, self-knowledge, social knowledge, behavior, and environmental response were created for the study. Results indicate that the proposed model for understanding faculty publication differences is a useful one. Other findings include: past role performance does influence current productivity; and consistent grant and publication involvement, larger commitment of time to research, and commitment to teaching are important correlates of publication rate and should be included in any future development of a causal model. Tables and figures are appended. Contains 67 references. (SM)

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Predicting Faculty Publication Output: Evaluation of a Model Across Institutional Types

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held at the Ritz-Carlton, Buckhead in Atlanta, Georgia, November 2-5, 1989. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Scholarly publication is the primary means of communicating with faculty peers about developments in the disciplines (Fox, 1985). Researchers concerned about the uneven publication rates across individuals, have identified numerous variables that predict faculty output. (See Finklestein, 1984, Blackburn, Lawrence, Ross, Okoloko, Bieber, Meiland, & Street, 1986, for summaries of these studies.) They have been striving to understand variations in publication output among faculty in similar institutions as well as differences across institutional settings. However, efforts to generalize across institutions have been hampered by differences in sampling as well as the operationalization of key concepts (Lawrence & Blackburn, 1988).

The existing research on scholarly productivity has focused primarily on its socio-demographic (Bayer & Dutton, 1977; Cole & Zuckerman, 1984; Hunter & Kuh, 1987; Lawrence and Blackburn, 1985; Persell, 1983; Elmore & Blackburn, 1983), career (Blackburn, Behymer, & Hall, 1978; Clark & Corcoran, 1985; Kuhn, 1970; Long & McGinnis, 1981; Long, Allison, & McGinnis, 1979; Wanner, Lewis & Gregorio, 1981), or organizational correlates (Caplow, 1968; Dill, 1982; Kanter, 1979; Long & McGinnis, 1981; Light, 1974; Pelz & Andrews, 1976; Reskin, 1978). A limited number of studies have investigated the relationships between productivity and faculty perceptions of their employing institutions or of higher education in general (Austin & Gamson, 1983; Clark, 1980; Clark, 1984; Parsons & Platt, 1973). A few have explored the relationships between productivity and faculty members' personal educational values and beliefs (Baldwin & Blackburn, 1981; Blackburn, 1974; Maehr & Braskamp, 1986). Although useful in a predictive sense, this literature does not adequately explain the process by which the diverse factors affect publication rates. Therefore, in an earlier study (Lawrence, Frank, Trautvetter, & Blackburn, 1989) a causal model, identifying both the direct and indirect effects of several individual and organizational variables and portrays such a process, was proposed and tested with research university faculty.

The purpose of the current study was to determine if this theoretical model of publication productivity was applicable to professors in other types of institutions. The data from Faculty at Work were used to evaluate the impact of several correlates of publication within doctoral universities and comprehensive colleges and universities. The analyses enabled us to address

several important questions about the extent to which organizational factors and individual differencies in preparation, prior activities, and perceptions influence faculty publication and to take a preliminary step toward developing generalizations about what motivates professors who publish.

Theoretical Perspective

Several lines of research guided the development of the model that has been tested and frames the current study. Personality and cognitive psychological research on motivation (Bandura, 1977; Bandura, 1982; Fisher, 1978; Galbraith & Cummings, 1967; Goodman, Rose, & Furcon, 1970; Hackman & Proter, 1968; Korman, 1971) and self concept development (Marsh, Barnes, Cairns, & Tidman, 1984; Shavelson & Bolus, 1982; Shrauger & Schoeneman, 1979) informed the model as did the higher education research on faculty career socialization (Bess, 1978; Clark & Corcoran, 1986; Clark & Corcoran, 1985; Clark & Corcoran, 1984; Creswell & Bean, 1981; Lane, 1985; Tuma & Grimes, 1981), accumulative advantage (Allison & Stewart, 1974; Cole & Zukerman, 1984; Lightfield, 1971), and organizational rewards and decision-making (Blau, 1973; Deci, 1971, Kasten, 1984; Katz, 1973; Lewis, 1974; McKeachie, 1979; Ory & Braskamp, 1981; Reisman, 1986; Staw, 1983; Tuckman, 1979; Tuckman & Hagemann, 1976).

The model of faculty research productivity elaborates a framework that Shower and Cantor (1985) use to integrate the literature on motivated strategies. Essentially, they argue that motivated cognitive strategies (decisions about how to behave) are a function of self knowledge (personal expertise, goals, dispositions), social knowledge (inferences one makes about her/his environment) and social contingencies (environmentally determined goals and constraints that affect behavior). In the proposed model (See Figure 1.), Self Knowledge and Social Knowledge are assumed to be key psychological variables that serve to influence behavior. Self Knowledge includes self-ascribed personality dispositions, values and beliefs, competence, and sense of control. Social Knowledge, on the other hand, represents, such elements as an individual's inferences about the overall organizational context and groups of people with whom he/she interacts--administrators, other faculty, and students.

[Insert Figure 1 about here.]

Environmental Conditions, Environmental Responses, and Social Contingencies are three categories of variables that are comparable to Shower and Cantor's environmental contingencies. Environmental Conditions include the consensual beliefs among the faculty of a university (e.g., the normative role expectations, adequacy of laboratory and library resources) as well as facts about the employing institution. Environmental Response is the feedback one gets about her/his behavior that may reflect organizational priorities or constraints (e.g., annual personnel reviews, promotion decision, salary rewards, graduate student assistants, collegial support). Social Contingencies are those non-work factors that can constrain or enhance work performance (e.g., number of dependents, divorce, spouse's income). Behavior, the time spent on various professional activities, represents the faculty member's decisions about how to act (cognitive strategies). Productivity includes the quantifiable outcomes of behavior: publications, number of courses taught, etc.

Two constructs, Career and Socio-demographic Characteristics, make the model particularly relevant to faculty members. Career represents the sum total of one's worklife accomplishments at a particular time (e.g., academic rank, professional reputation, publication records) along with factors that indicate the context of those accomplishments (e.g., discipline, graduate education background, career age). Socio-demographic background includes ascribed characteristics (e.g., gender, race, age) that can affect an individual's access to career opportunities (e.g., inclusion/exclusion from informal.or formal social networks).

The model is longitudinal and posits that Socio-demographic characteristics (e.g., gender) can affect Career (e.g., graduate school background) which then influences Self Knowledge (e.g., individual professorial values). This Self Knowledge subsequently affects Social Knowledge, or how one perceives the employing institution (e.g., the individual's inferences about the organization's emphasis on research). In turn, this understanding of the organization can influence Behavior (e.g., time spent on research) and Productivity (e.g., rate of publication). Carrying the

example further, the model assumes Environmental Response (e.g., rewards for publishing) may influence Social Knowledge (e.g., confirm/disconfirm/modify inferences). The productivity-feedback loop, consisting of Social Knowledge, Behavior, Productivity, and Environmental Response, is repeated and over time Productivity may alter Career (e.g., One's scholarly reputation and publication record can be enhanced.). Career can then affect Self Knowledge (e.g., One's self concept as a researcher is altered based on one's success.). Further, feedback on Behavior, independent of Productivity, can change Social Knowledge and, as the model indicates, modifications in Behavior can result in changes in Self Knowledge (e.g., as a professor spends more time on research, his or her sense of competence as a researcher may shift). Environmental conditions are affected by factors that are both exogenous to the model (e.g., state or national funding priorities, population demographics) and endogenous in the sense that consensual norms may vary depending on the organization's membership at a given time.

Method

Several factors have hampered attempts to develop a theoretical model of faculty motivation that is relevant to different types of institutions. The lack of identical measures from individuals in the same disciplines but different postsecondary institutions and the dearth of longitudinal data are among the key limitations. Although a few researchers have described productivity changes through time-ordered analyses using citation indexes and vitae (Allison & Stewart, 1974; Hammel, 1980; Long, 1978; Reskin, 1989), these studies fall short of explaining how individuals relate to their environments and how these interactions may change and influence scholarly output over time. For example, the notion that some professors achieve early recognition for their work and this reputation gives them an edge over their peers in competition for funds and publication (the accumulative advantage process) was based on cross-sequential analysis of citation indexes and not longitudinal data (Allison and Stewart, 1974).

The data used in this study were drawn from Faculty at Work, a national survey conducted by the National Center for Research to Improve Postsecondary Teaching and Learning (NCRIPTAL) during November, 1987

through January, 1988. The sample (N = 3,972) was distributed across the nine Carnegie Classification Categories (Carnegie Council, 1976) and across eight disciplines selected to represent a cross-section of the liberal arts (history, English, sociology, psychology, political science, chemistry, biology, and mathematics). Survey sample selection was carried out in two stages. First, institutions were stratified by Carnegie Categories, and both the number of faculty members in each Category and the percentage of all faculty in the United States who fell in each Category was estimated. Second, institutions were selected at random until the final sample corresponded to the national distribution of faculty across Carnegie Classification Categories. (See NCRIPTAL Program D Technical Report, 1989.)

In addition to standard socio-demographic and career indicators, the survey instrument measures faculty perceptions of their colleges or universities as well as their own competence and efficacy, values and beliefs, and psychological dispositions. Furthermore, the instrument includes a variety of items that assess current distribution of effort (Fall Term, 1987), current rate of publication (1985-1987), prior rate of publication (up to 1985), and current and prior rates of grant and fellowship application and acquisition These measures allowed us to distinguish between the individual's cumulative publication, grant, and fellowship application/acquisition records (Career variables in the model) and current rate of publication (the outcome variable). Hence, the effects of prior accomplishments on current performance could be tested. Unlike most previous surveys, the rate of publication was a continuous variable; consequently it provided more refined discriminations among respondents[1] . In summary, the structure of the NCRIPTAL sample and the nature of the survey items allowed us to evaluate the model with faculty in the same disciplines across institutional settings.

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[1] A common problem with categorical publication data has been a plateau effect.

Analysis/Results

Measures of Career, Self Knowledge, Social Knowledge, Behavior, and Environmental Response were created by completing a separate varimax rotation factor analysis for each of the following Carnegie Council Categories: Carnegie Research University-I, Doctoral Granting University-I, and Comprehensive College University-I Institutions. The factors were extracted from all survey items that assessed each of five model constructs. The factors and discrete measures (e.g., sex, race, age, discipline) were entered into hierarchical multiple regression analyses in the order represented in Figure 1: Socio-demographic variables were entered first, followed by Career, Self Knowledge, Environmental Response, Social Knowledge, and Behavior. The causal model was not evaluated. Rather, the multivariate regressions were done in order to determine if causal analyses should be completed--i.e., whether the amount of explained variance was sufficient to justify path analysis. The results of the three analyses were compared to determine the direct effects of the model constructs on publication output in the three types of institutions and to evaluate the overall predictive power of the causal model.

The samples from the research universities (N=601), doctoral granting universities (N=366), and comprehensive colleges and universities (N=1004) were similar in terms of socio-demographic characteristics and disciplinery affiliations. (See Table 1.) However, the average two year publication rates varied across settings. The research university faculty had the highest rate (M = 6.1, Sd = 6.6), followed by doctoral faculty (M = 4.0, sd = 5.3), and comprehensive faculty (M = 2.1, sd = 3.7).

Each of the factor analyses resulted in a different number of factors as well as different factor structures for each institutional category. However, the intercorrelations among factors were small for all institutions (coefficients ranged from r = -.200 to r = .200) consequently, it seems reasonable to assume the factors were measuring different aspects of each of the model constructs. A total of 61, 67, and 68 variables were entered into the regressions for Research University-I, Doctoral University-I, and Comprehensive College and University-I Institutions, respectively. In all instances, the largest number of variables were

subsumed under Social Knowledge (24, 22, 21, respectively). The fewest variables were under Career (3).

The following descriptions are for only those factors that entered the hierarchical regressions.[2] (Note - The factor loadings are in parentheses.)

1. **Socio-Demographic Characteristics**
   a) Sex was coded 0 = male and 1 = female.
   b) Race was coded as dummy variables: DBlack where 1 = Black and 0 = all others, DAsian where 1 = Asian,) 0 = all others and DOther where 1 = those who were not Black, White, or Asian and
   c) Age was chronological age as of 1987.

2. **Career Variables**

The eight disciplines were coded as dummy variables with Biology as the constant.

Research-I
a) Active Publisher/Grantsperson. This is a two-item factorially - derived measure including: goal publications prior to 1985 (.750) and number of grant proposals submitted prior to 1985 (.546). Eigenvalue = 1.29.

b) Educational Preparation. This two-item factor includes the highest degree earned (.666) and the type of graduate institution attended- i.e, Research University or other (.704).

Eigenvalue = 1.08.

Comprehensive-I
a) Active Publisher/Grantsperson. This is a three-item factorially derived measure including: total publications prior to 1985 (.737), number of grant proposals submitted prior to 1985 (.548), and number of books published prior to 1985 (.673)
Eigenvalue = 1.50.

Doctoral-I
a) Active Publisher/Grantsperson. This is a three-item factor including total publications prior to 1985 (.794), number of grant proposals submitted prior to 1985 (.696), and number of books published prior to 1985 (.505). Eigenvalue = 1.53.

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[2] A complete description of the factor analysis is available from the authors.

b) Established Faculty Member. This is a three-item factor consisting of career age (years since highest degree awarded) (.878), tenure status prior to 1985 (.828), and current academic rank (.723). Eigenvalue = 2.47.

3. **Self Knowledge**

Research-I

a) Committed to Teaching. This measure includes the following items: personal interest in teaching (.850) high commitment to teaching (.690), high commitment to research (-.667), personal preference for time spent on teaching (.817), and personal preference for time spent on research (-.733). Eigenvalue = 4.22.

b) Values Discipline-Focused Teaching. This factor is composed of assumptions about the teacher's role in the teaching-learning process: transmitting facts and principles (.725), demonstrating an intellectual/artistic/scientific process (.698), enhancing students' abilities to reason and communicate (.525), and assisting students who demonstrate an interest in learning (.586). Eigenvalue = 1.41.

c) Values Cooperation/Institutional Commitment. This two-item factor consists of self-ratings indicating the value one places on being a "team player" (.750) and her/his devotion to the employing institution (.780). Eigenvalue = 1.21.

d) Values Scholarship. This variable is single-item measure of personal preference for giving time to activities that enhance one's knowledge or skill in ways that may not result in publication (-.925). Eigenvalue = 1.05.

e) Competent Researcher. This factor includes self evaluations in three areas: keeping abreast of developments in the discipline (.540), obtaining grants (.809), and publishing (.744). Eigenvalue = 1.66.

Doctoral-I

a) Committed to Teaching. This measure includes the following items: personal interest in teaching (.889), high commitment to teaching (.593), high commitment to research (-.789), personal preference for time spent on teaching (.848), and personal preference for time spent on research (-.854). Eigenvalue = 4.09.

b) Responsible Faculty Member. This four-item factor is comprised of self appraisals indicating the extent to which the individual is organized (.551), works well with students (.527), responds to

organized (.551), works well with students (.527), responds to requests (.799), and knows how to "work the system" (.555). Eigenvalue = 1.58.

Comprehensive-I

a) Committed to Teaching. This measure includes the following items: personal interest in teaching (.881), commitment to research (-.829), personal preference for time spent on teaching (.716), and personal preference for time spent on research (-.874). Eigenvalue = 4.03.

b) Values Discipline Focused Teaching. This two-item factor consists of assumptions about the teacher's role in the teaching-learning process: transmitting facts and principles (.771) and demonstrating an intellectual/ artistic/scientific process (.653). Eigenvalue = 1.27.

c) Competent Researcher. This three-item factor is comprised of self-appraisals in three areas: keeping abreast of developments in the discipline (.571), obtaining grants (.765), and publishing (.822). Eigenvalue = 1.50.

4. Environmental Responses

Research University-I. No factors entered the regression.

Doctoral-I

a) Journal Editorial Work. This two-item factor indicates how often the faculty member reviews articles for a professional journal (.803) and serves on an editorial board of a journal (.826). Eigenvalue =1.52.

Comprehensive-I

a) Journal Editorial Work. This two-item factor also consists of levels of involvement in reviewing articles (.838) and editorial work (.835). Eigenvalue = 1.38.

5. Social Knowledge

Research-I

a) Credible Colleagues. This measure emerged from a factor analysis of a question about how much credence respondents gave to several forms of performance feedback. The scores ranged from 1 = Never Received to 5 = Great Deal of Credence. The two variables that loaded were your colleagues' evaluation of

your teaching (.826) and your colleagues' comments on your scholarly work (.662). Eigenvalue = 1.17.

Doctoral-I

a) Faculty Committed to Teaching. This is a two-item factor created from respondents' assessments of their faculty colleagues' commitment to teaching their discipline rather than adding to their discipline's knowledge base (.876) and their commitment to teaching rather than research in their disciplinary domain (.869). Eigenvalue = 2.25.

b) Students are Motivated. This five-item factor includes respondents' perceptions of undergraduate students, Specifically, the extent to which they think for themselves (.704), share ideas and work cooperatively (.610), learn only what is required (-.668), lack interest in the subject matter (-.678), and work on their own (.736). Eigenvalue = 3.17.

c) Teacher Control Needed. This three-item factor is comprised of respondents' assumptions that undergraduates learn best when course content is determined cooperatively by the student and the teacher (-.589), course content is determined by the teacher (.859), and pace is set for the group by the teacher (.827). Eigenvalue = 2.26.

d) Course Relevance Important. This two-item factor is also extracted from the survey question about faculty perceptions of undergraduate students and represents the expectation that they learn best when course content is perceived to have immediate relevance to the students' lives (.780) and course content is determined cooperatively by students and the teacher (.524). Eigenvalue = 1.54.

e) Credibility of Alumni. This single item factor measures credence of feedback from alumni about faculty members' impact on them as students.(.681).
Eigenvalue = 1.17.

f) Students are competitive. This factor is the expectation that students seek to outperform one another (.810).
Eigenvalue = 1.01.

g) Well-Rounded Teacher Valued. The seventeen-item measure emerged from factor analysis of a question that asked respondents to indicate the skills, beliefs/values, and personality traits that they believed characterized the valued faculty member on their campus. The scores ranged from 1 = Not at All Characteristic to 5 = Highly Characteristic. The following characteristics loaded on this factor: teaches effectively (.565),

communicates well (.616), is organized (.527), works skillfully with students (.674), responds to requests (.679), is an excellent lecturer (.567), is highly committed to teaching (.690), is concerned about students (.742), holds high standards (.585), has integrity (.764), respects others (.859), is dedicated to the liberal arts (.643), is supportive (.830), is understanding (.861), is open (.879), is candid (.799), has a sense of humor (.784), and is personable (.654). Eigenvalue =11.9

h) Ambition/Dedication Valued. This five-item measure emerged from the same question about the institutionally-valued faculty member. It consists of several disposition and belief characteristics: believes in the virtue of hard work (.588), is dedicated (.597), is ambitious (.717), is competitive (.713), and is perserverant (.763). Eigenvalue = 4.80.

i) Salary Equity. This two-item factor is derived from faculty perceptions of how fair their salaries are in comparison with those of peers in their institution (.787) and how their salaries compare with colleagues at other peer institutions (.787). Eigenvalue = 1.34.

j) Institution Values Scholarship. This factor indicates what percent of 100% effort faculty thought their colleges or universities wanted them to give to scholarship (e.g., self-enhancement but not publication) (.865). Eigenvalue = 1.14.

6. **Behavior**

Research-I

a) Grant Preparation. This two-item factor includes the number of external grant proposals submitted within the last two years (1985-1987) (.763) and the number of research proposals submitted to a government or private agency within the last two years (.817). Eigenvalue = 2.08.

b) High Research Effort. This factor consists of two items: percentage of time given to research (.675) and to teaching during the current term (-.831). The possible responses ranged from 0% to 100%. Eigenvalue = 1.38.

c) Communicates/Works Hard. This three-variable factor includes two items that assess the number of times during the last year the respondent conversed informally about research with colleagues at professional meetings (.541) or on the telephone (.535). The responses ranged from 1 = Never to 5 = More Than Ten Times. The third variable indicated whether the previous estimation was

more, the same, or less time than five years ago (-.653). Eigenvalue = 1.32.

d) Applying for Fellowship. This variable indicates the number of fellowship applications submitted within the last two years (1985-1987) (.698). Eigenvalue = 1.09.

Doctoral-I

a) High Research Involvement. This six item factor includes the number of times during the last year the respondent conversed informally about research with colleagues on the telephone (.588), submitted articles for publication in an academic or professional journal (.626), submitted research proposals to a governmental or private agency (.715), and submitted external grant proposals within the last two years (1985-1987) (.649). Percentage of full time given to research (.769) and to teaching (-.697) during the current term also loaded on this factor. The possible responses ranged form 0% to 100%. Eigenvalue = 3.45.

b) Dissertation Work. This four-item factor indicates, for the current and past year, the number of dissertation committees served on and chaired (.777, .723) and the number of comprehensive examinations/orals committees served on and chaired (.731, .736). Eigenvalue = 2.25.

c) Organizational Decision-Making. This measure consists of three items indicating the number of times in the last five years that the respondents participated in campus-wide committees dealing with major issues (.660), played a role in unit's curriculum revision (.774), and conducted a study to help solve a unit problem (.743). Eigenvalue = 2.00.

d) Fellowship Proposals/Team Teaching. This measure consists of two items: the number of times a respondent has team taught a class in the past five years (.628) and the number of external fellowship applications they have submitted within the last two years (1985-1987) (.624). Eigenvalue = 1.14.

Comprehensive-I

a) High Research Involvement. The four-item factor includes two that assess the number of times during the last year the respondent conversed informally about research with colleagues at professional meetings (.612) or on the telephone (.714). The responses ranged from 1 = Never to 5 = More Than Ten Times. The other two items were the number of times in the last two years articles were submitted for publication in an academic or professional journal (.650) and time given to research (.611). Eigenvalue = 2.08.

b) Grant Preparation. This two-item factor consists of the number of times in the last two years a research proposal has been submitted to a governmental or private agency (.808) and the number of external grant proposals submitted within the last two years (1985-1987) (.826). Eigenvalue = 1.55.

Environmental conditions were taken into account in this analysis by running separate regressions for each of the Carnegie Institutional Categories. The assumption was that the colleges and universities within each category were similar in terms of mission, the quality of students and faculty, and institutional resources for research. Unfortunately, there are no measures of Social Contingencies as defined in the model within the NCRIPTAL data set.

Effects of Theoretical Constructs on Productivity

Research University-I Institutions. The data displayed in Table 2 indicate that the variables entered into the regression explained 58.5% of the variance in current publication rate (total publications between 1985-1987). Behavior was the best predictor of publication rate. Specifically, those faculty members who, over the last two years, had been actively involved in the preparation of grant proposals and those who had given more time to research and less to teaching were publishing more. So, too, were respondents who spent more time working and communicating with colleagues about scholarly and research issues and/or had been actively engaged in applying for fellowships. Faculty members who attended or made presentations about their research on their own campuses also published at a higher rate.

[Insert Table 2 about here.]

The results further suggest that the direct effects of the Career, Self-Knowledge, and Social Knowledge variables were mediated by Behavior. The direct effects of faculty members' educational preparation and cumulative publication/grant record (all publications and proposals submitted before 1985) on current publication rate were reduced when the behavior variables entered the model. On the other hand, the effects of selected measures of Self Knowledge and Social Knowledge became significant only after the Behaviors were entered. A personal commitment to teaching had a positive effect on

publication, suggesting that productive publishers may also be concerned about their teaching. The negative beta for Values Scholarship indicates, however, that persons who prefer to spend time on activities that enhance their knowledge or skills are not necessarily publishing. The emergence of the Social Knowledge factor, (Credible Colleagues) a perception that one's colleagues give credible feedback on both one's teaching and scholarship, suggests its effect may be enhanced by the Behavior (Communicates/Works Hard). Professors who find their colleagues' critiques are useful may communicate with them more often about research manuscripts. These interpretations ought to be among the hypotheses that are tested with path analyses.

Doctoral Granting Universities-I Institutions. The variables entered into the regressions appear to be particularly important within the doctoral universities, explaining 77.5% of the variation in current publication rate. (See Table 3.) The results indicated that at least one measure of each model construct influenced publication. The strongest predictor was a Behavior variable (High Research Involvement): this factor meant a professor was giving more time to research and less to teaching in the current term and had been actively submitting grant proposals and articles for publication over the last two years. Next came a second Behavior (Dissertation Work), a factor that shows a faculty member's high level of involvement in students' doctoral research and comprehensive examinations. Self Knowledge in the form of greater commitment to research than teaching, signified by the negative beta for Committed to Teaching, continued to influence publication rate from initial entry through the final step in the regression. Likewise, a Career factor (Active Publisher/Grantsperson) representing one's cumulative research record as of 1985 exerted a continuous influence on publication rate, although its effect diminished. On the other hand, chronological age (Socio-demographic variable) became an important predictor only when Behavior entered the model and indicated that older professors were publishing at a higher rate. Finally, Institution Values Scholarship, the perception that one's university encourages scholarship (Social Knowledge), also had a positive impact on publication rate.

[Insert Table 3 about here.]

Generally speaking, the systematic controls on Behavior enhanced the impact of the other variables in the model. The only variable that entered the regression and did not remain through the last step was Journal Editorial Work, a factor indicating the level of involvement in reviews and editing. Path analyses will need to be conducted in order to trace the influence of these variables. The fact that seven of the Social Knowledge variables came to exert significant affects on publication rate after Behavior was controlled suggests, however, that these views of students and organizational climate are important and are not transmitted through the Behaviors specified in this regression.

Comprehensive College and University-I Institutions. The theoretical constructs within the model account for 39% of the variance for this group of institutions, a highly significant amount even though less than for the other two types. (See Table 4.) The strongest predictors of publications between 1985 and 1987 were two Behavior variables: Grant Preparation, signifying activel involvement in grant preparation and high research effort, highly involved in research over the past two years. While the betas for each were not especially large, both were significant at $p < .000$. The only other variable that remained in the final regression was an Environmental Response factor, Journal Editorial Work, that indicated the faculty members were actively involved in reviewing articles for journals and serving on the editorial board of a journal. This factor was significant at $p < .05$ and had a beta coefficient of .009 it was, therefore, not a strong predictor.

[Insert Table 4 about here.]

As for the other components of the model, only one Socio-demographic variable, Age, appeared in step one but did not produce a significant R^2 (the negative value indicates that it was younger faculty who published more). No Socio-demographic variable appeared in steps 2 - 6.

One Career variable representing people who were actively publishing books and articles and submitting grant proposals prior to 1985, Active Publisher/Grantsperson, was statistically significant in steps 2 - 5, but its direct effects were mediated when the Behavior variables were entered in step 6.

Further, the betas for the Career factor diminishes at each succeeding step; that is, the strength of the variable lessens with the addition of the variables in the remaining theoretical categories.

Three Self Knowledge variables, a personal valuation of discipline focused teaching (Values Discipline-Focused Teaching), a self judgement that one is a competent researcher (Competent Researcher), and a strong commitment to teaching (Committed to Teaching), initially entered the regression. (Note that the two teaching factors have negative betas. To the extent that teaching and research are in competition with one another, that is, are opposite ends of a continuum, the negative teaching betas can be interpreted as positive research ones.) The first two of the three factors are mitigated with the entry of Social Knowledge at step 5, even though no variables subsumed under the Social Knowledge construct were significant, and direct effects disappear when Behavior variables are entered in the last step. The increase in R^2 at each successive step was significant at $p < .01$ except for step 5 when Social Knowledge was introduced. This finding further suggests that faculty perceptions of their environment may somehow be related to their personal values, competence, and psychological dispositions.

Discussion

Although the NCRIPTAL data allowed us to complete analyses that we had not been able to do previously, some limitations to the data set continued to restrict our ability to generalize. The present study focused on only one outcome; publication rate during a two-year period. Publication is an important form of faculty productivity at this time in higher education. However, other productivity variables exist within the NCRIPTAL survey (e.g., level of service on college/department committees, grants, and fellowships obtained, level of effort to teaching) that could be combined to form a more comprehensive outcome measure. Further, assessments of Environmental Conditions are not refined. In the analyses, we assumed that the criteria for grouping institutions into categories were valid and result in different types of organizational contexts. Institutions within each of these categories may differ and we do not take these differences into account except for the faculty members' perceptions of these differences as measured by Social Knowledge. The number of

respondents from each of the institutions varies considerably. In some cases the institutional sample size is sufficient to introduce controls for individual colleges and universities. In most instances, this is not possible. Also, the reader should be cautioned that the factors are usually not the same across institutional settings. Therefore, the discussion is primarily about the impact of the model constructs on publication rate and not on specific factors.

The results suggest that the proposed model, or framework, for understanding faculty publication differences is a useful one. The variables taken into account predicted 77.5%, 58.5% and 39.0% of the variance in two-year publication rates in the doctoral, research, and comprehensive institutions, respectively. As each group of variables entered into the regression, the amount of explained variance increased in a linear fashion. However, except for the Career and Behavior variables which always produced significant changes the R^2, the size of the increase was not always significant across settings.

In Research University-I Institutions the Self Knowledge, Environmental Response, and Social Knowledge variables together accounted for very little variance in publication rate, and none of these variable groups produced a significant change in this productivity measure. In the Doctoral Granting University-I Institutions the Self Knowledge measures produced a significant change in the amount of predicted variance but Environmental Response and Social Knowledge Measures did not. Both the Self Knowledge and Environmental Response Variables increased the explained variance in publication rate within the Comprehensive College and University-I Institutions.

Although the factor is not identical for all three institutional categories the Career variable, Active Publisher/Grantsperson, is an important predictor in all regression analyses. This finding suggests past role performance does indeed influence current productivity. A second Career variable, Commitment to Teaching, is the same factor for all institutions, but among research university faculty it has positive direct effects on publication and among the doctoral university faculty it has a negative effect. One Behavior, the High Research Involvement factor, was important in the comprehensive and doctoral institutions. However, only four of the Behavior items that loaded on this factor

were the same. They indicate that faculty who devoted more time to research than to other activities, who conversed with others about research, and submitted larger numbers of manuscripts for publication were publishing more often.

It is unfortunate that we were not able to create standardized betas and test the relative impact of the three factors on publication rates in the different settings . The findings suggest consistent grant and publication involvement, larger commitment of time to research, and commitment to teaching are important correlates of publication rate and should be included in any future development and testing of a causal model that is applicable to faculty in different types of institutions. Path analyses would help us understand the indirect and direct effects of these factors and other antecedents of Behavior and specify which of the Career, Self Knowledge, Environmental Response, and Social Knowledge variables exert an influence through the Behavior measures.

However, other interesting questions arise that might be answered through causal modeling. Why does Social Knowledge have more direct effects on faculty publication in the doctoral institutions while Self Knowledge is more important in the research universities? Are differences across doctoral institutions greater in terms of student quality and faculty commitments to teaching, therefore, causing these variables to emerge as strong predictors of publication rate along with Behavior? In research institutions, are organizational conditions more homogeneous, allowing for individual differences in competence and commitment to emerge as significant predictors? Among the comprehensive institutions, are there key differences in organizational priorities and faculty skills that result in a relatively small number of variables becoming significant predictors? (This institutional category had the smallest portion of doctorally prepared faculty members.). These questions and others are ones we plan to address in future analyses.

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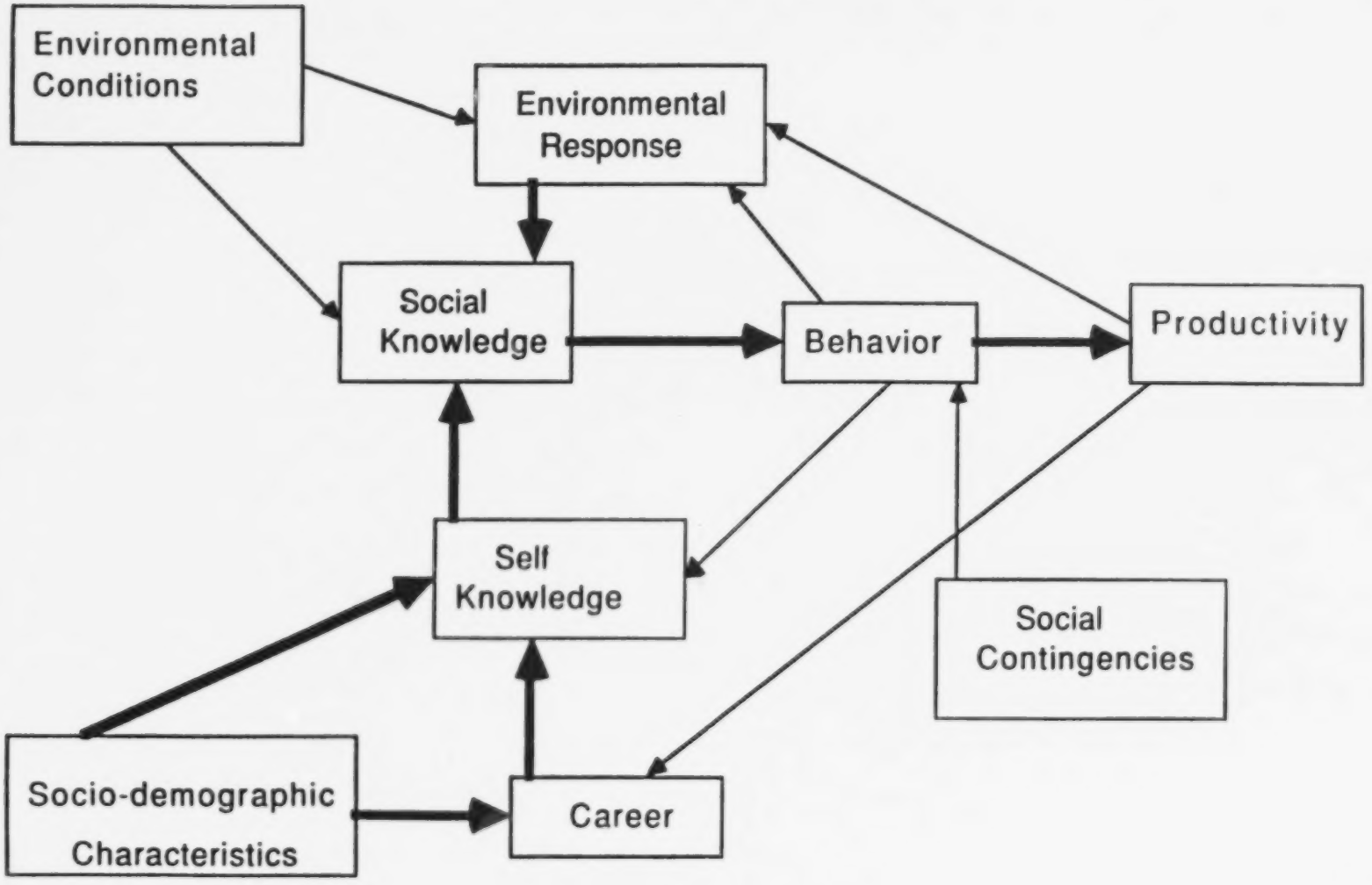
Figure 1



Model of Faculty Publication Productivity

Table I
Distribution of Institutional Samples
Across Socio-demographic Variables

	Res I	Doct I	Comp I
Number of Institutions	7	6	26
Number of Faculty Respondents	601	366	1004
Percent Female	17.9	19.4	19.2
Percent Ph.D.	97.7	93.7	86.7
Discipline			
% Biology	14.2	10.5	13.9
% Chemistry	12.2	10.5	10.8
% Math/Stat	10.7	11.9	14.6
% English	14.9	20.2	20.4
% History	12.9	13.9	10.8
% Political Science	10.8	10.0	8.4
% Psychology	13.6	15.0	13.4
% Sociology	10.7	8.0	7.7
Rank			
% Assist Professor	15.4	15.7	18.6
% Assoc Professor	24.8	31.4	31.2
% Full Professor	58.5	52.9	49.9
% Other	1.4	-	.3
Appointment			
% Regular Appt w/Tenure	82.7	81.6	82.3
% Regular Appt w/o Tenure	14.6	15.9	15.4
% Other	2.7	2.5	2.3
Race			
% Caucasian/White	94.8	95.8	93.5
% Black, Asian and Other Race	5.2	4.2	6.5
Number of Publications in the Last 2 Years (mean/std)	6.1/6.6	4.0/5.3	2.1/3.7

Table 2: Predicting Publication Rates Research University - I

	Steps					
Variables at Succesive Steps	1	2	3	4	5	6
1. Socio Demographics						
none entered						
2. Career						
English						.266**
Active Publisher/Grantsperson		.447***	.312***	.290***	.263**	
Educational Preparation		-.132*	-.135*	-.135*	-.144*	
3. Self Knowledge						
Committed to Teaching						.245**
Values Cooperation/Institution Commitment						-.180**
Values Discipline Focused Teaching						-.121*
Values Scholarship						-.182**
Competent Researcher			.169*	.159*		
4. Environmental Response						
none entered						
5. Social Knowledge						
Credible Colleagues						.144*
6. Behavior						
Communicates/Works Hard						.383***
Applying for Fellowship						.382***
High Research Effort						.464***
Attends Local Research Seminars						.239***
Grant Preparation						.452***
2 Year Publication Rate R^2	.007	.286***	.358***	.364***	.383***	.585***
Significance of R^2 Increase		.000	.205	.750	.994	.000

Note - The betas are standardized beta coefficients.

* $p \leq .05$
** $p \leq .01$
*** $p \leq .000$

Table 3: Predicting Publication Rates Doctoral Granting Universities - I

	Steps					
Variables at Succesive Steps	1	2	3	4	5	6
1. Socio Demographic						
Black						-.127*
Age						.378***
2. Career						
Active Publisher/Grantsperson		.606***	.517***	.472***	.485***	.329***
Chemistry						.177*
English						.226*
Established Faculty Member						-.261**
3. Self Knowledge						
Competent Scholar						.233**
Committed to Teaching			-.231**	-.230**	-.230*	-.360**
4. Environmental Response						
Journal Editorial Work				.165***		
5. Social Knowledge						
Credibility of Alumni						-.143*
Teacher Control Needed						.143*
Course Balance Important						.301*
Students are Competitive						.136*
Students are Motivated						-.180**
Well Rounded Teacher Valued						-.170**
Ambition/Dedication Values					.157*	.285***
Salary Equity					-.175*	-.215**
Institution Values Scholarship					.197**	.319***
Faculty Committed to Teaching						.256***
6. Behavior						
Fellowship Proposals/Team Teaching						-.200**
Dissertation Work						.391***
Organizational Decision Making						-.137*
High Reseasrch Involvement						.875***
2 Year Publication Rate R^2	.014	.408***	.513***	.533***	.623***	.775***
Significance of R^2 Increase		.000	.024	.186	.167	.000

Note - The betas are standardized beta coefficients.

Table 4: Predicting Publication Rates Comprehensive Colleges and Universities - I

	Steps					
Variables at Succesive Steps	1	2	3	4	5	6
1. Socio Demographics						
Age	-.096*					
2. Career						
Active Publisher/Grantsperson		.313***	.161***	.135**	.130**	
3. Self Knowledge						
Values Discipline Focused Teaching			-.107*	-.101*		
Competent Researcher			.155**	.124*		
Committed to Teaching			-.242***	-.221***	-.222***	
4. Environmental Response						
Journal Editorial Work				.165***	.165***	.099*
5. Social Knowledge						
none entered						
6. Behavior						
Grant Preparation						.221***
High Research Involvement						.375***
Two Year Publication Rate R^2	.010	.128***	.277***	.300***	.316***	.390***
Significance of R^2 Increase		.000	.000	.010	.994	.000

Note - The betas are standardized beta coefficients.